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for the Behavioral and Social Sciences**

Research Report 1803

**Development and Evaluation of Communication-
Based Measures of Situation Awareness**

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U.S. Army Research Institute**

May 2003

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Research Report 1803

**Development and Evaluation of Communication-Based
Measures of Situation Awareness**

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FOREWORD

The Infantry Forces Research Unit of the U.S. Army Research Institute for the Behavioral and Social Sciences conducts research that contributes to a better understanding of soldier-based instructional issues under its *Training Modernization for Infantry Forces* research program. In support of this objective, our scientists have participated in 14 field experiments conducted under the auspices of the Military Operations in Urban Terrain (MOUT) Advanced Concept Technology Demonstration (ACTD) program. The last of these field experiments formed the basis of this report. It investigated the degree to which squad radios contribute to the battlefield situation awareness (SA) of squad leaders and squad members.

Prior to this field experiment, we developed a pair of new instruments for measuring the SA of small unit leaders based on information that could be gleaned from the unobtrusive real-time monitoring of platoon and squad radio networks. From an initial pool of 318 critical incidents of communication behavior, 60 were culled on the basis of high independent evaluator agreement to form the Radio Communications Checklist of Leader Awareness (RCCOLA) and the Future Expectations of Likely Leader Awareness (FELLA) scale. This report documents the methodological development of these new SA measures and presents the results of a limited field evaluation involving seven squad leaders for six trials each.

Although the size of our squad leader sample prevents one from drawing any definitive conclusions about the RCCOLA and FELLA instruments, results were promising and generally positive. Both instruments demonstrated high levels of interrater agreement and both can be said to possess a certain measure of content-related validity, based on the way the instruments were constructed. We recommend their future use, for both training and continued research, in all situations where small unit radio networks can be monitored by qualified personnel. These results have been presented to key research sponsors in the MOUT ACTD and Objective Force Warrior (OFW) programs during March of 2003. We hope to interest you to learn more about the potential SA benefits of improved soldier communication at the small unit level.



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DEVELOPMENT AND EVALUATION OF COMMUNICATION-BASED MEASURES OF SITUATION AWARENESS

EXECUTIVE SUMMARY

Research Requirement:

It is generally accepted that the most precise way of gauging situation awareness (SA) is to use objective measures, where important aspects of the situations investigated can be accurately known to both research participants and experimenters. Unfortunately, objective measures are relatively obtrusive and difficult to administer. They also lack robustness across situations, as a new test must be developed for each experimental scenario. The present investigation sought to develop and field test two new behavioral measures of SA that were based on the content of small unit radio transmissions monitored by unobtrusive observers.

Procedure:

A team of four retired military personnel was given a two-hour training workshop on how to write critical incidents of communication behavior. Over the course of the next several weeks, the team generated a pool of 318 incidents of communication behavior, each intended to represent either an outstanding, typical, or poor level of SA on the part of squad and platoon leaders. This item pool was then given to a group of 24 independent evaluators. Each evaluator was asked to judge whether or not each item reflected the SA of small unit leaders. If they judged an item as being related to the concept of SA, they were also asked to indicate whether the item suggested an outstanding, typical, or poor level of SA. For each of the three levels of SA, the 20 items with the highest levels of agreement among the independent evaluators were formed into two communication-based SA measures. These were termed the Radio Communications Checklist of Leader Awareness (RCCOLA) and the Future Expectations of Likely Leader Awareness (FELLA) scale. Although both measures were based on the same 60 items, they differed greatly in their format. The RCCOLA checklist was used to record how frequently a specific set of behaviors occurred during the course of a mission, while the FELLA questionnaire was completed at the end of a mission and asked raters to predict or estimate the likelihood these behaviors would occur in future missions along a seven-point Likert scale.

Six field trials were then conducted with each of seven squad leaders and their respective squads. All trials for a given squad consisted of variations of a reconnaissance/link-up mission and were completed within a 12-hour time period. Three squad radio conditions were used, with one day and one night trial conducted for each condition. The conditions were no squad radio, squad radio with only the squad leader transmitting, and squad radio with both the squad leader and squad members having the freedom to transmit. Based on their monitoring of squad and platoon radios, two independent raters completed a separate RCCOLA checklist during each of the 42 total trials, as well as a separate FELLA scale after the completion of each trial.

Findings:

Based on the percentage of nearly identical item scores (± 1), interrater agreement was found to be generally high for both the RCCOLA checklist (97.5%) and the FELLA scale (84.4%) across trials. Because they were constructed from items having a high level of agreement among independent evaluators, we can also assume both measures possess a certain amount of content-related validity. Though it did not approach statistical significance, a small consistent trend among the squad radio conditions and our communication-based measures was found. In particular, the highest average SA scores were obtained during trials when squad members were allowed to transmit freely, perhaps because there were a significantly greater number of audible squad radio transmissions during these trials ($p < .001$).

Utilization of Findings:

We recommend the use of RCCOLA checklist and FELLA scale in future research, field exercises, and virtual training environments where radio transmissions of small unit personnel can be monitored. Additional research is needed to increase the sample of small unit leaders, to determine the relationship of communication-based measures to more objective measures of SA, and to gauge their utility for a wider variety of soldier missions.

As squad and platoon radios are beginning to proliferate within small units, the ability of our soldiers to communicate effectively with each other will become a critical factor influencing their ultimate level of combat effectiveness. How squad members contribute, or fail to contribute, to the SA of their squad and platoon leaders is an after-action review topic that needs more emphasis. Similarly, we also need to understand and emphasize how the communication behaviors of small unit leaders contribute or detract from the situational understanding of their subordinates. Before the promise of better small unit communication can be realized, however, we must get trainers and observer/controllers to routinely monitor squad and platoon radios during field exercises and training center rotations. Once optimal squad and platoon radio communication procedures have been identified, they need to be formally introduced into appropriate institutional courses for the benefit of junior leaders. We believe that communication-based measures of SA, such as those explored in the present report, can serve an important role in improving the communication practices and resulting levels of situational understanding among all soldiers at the small unit level.

DEVELOPMENT AND EVALUATION OF COMMUNICATION-BASED MEASURES OF SITUATION AWARENESS

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DEVELOPMENT AND EVALUATION OF COMMUNICATION-BASED MEASURES OF SITUATION AWARENESS

Introduction

The present research effort is a largely serendipitous product of two ongoing lines of investigation, specifically research related to the measurement and training of situation awareness (SA) in Infantry leaders and research aimed at discovering the most effective tactics, techniques, and procedures (TTPs) to use with squad and platoon radio networks. In the first case, identifying SA requirements and their relationships with emerging technology was the focus of early thought in the area of Infantry SA (Graham & Matthews, 1999). Building upon the earlier theoretical work of Endsley (1995b), an Infantry-focused model of individual SA was developed (Endsley et al., 2000). As a prelude to developing an Infantry SA trainer, the highest-priority SA training requirements were also identified. These requirements were schema training, task management and prioritization, communications training, and contingency planning (Strater, Jones, & Endsley, 2001).

It is generally accepted that the most precise way of gauging SA is to use objective measures, where various aspects of the situations investigated can be accurately known to both research participants and experimenters (Endsley, 1995a; Redden & Blackwell, 2001). There the focus of measurement is on the degree to which individual perceptions of situational characteristics differ from what is known to be "ground" truth. Though their reliability and validity are usually more than adequate, objective measures are relatively obtrusive and difficult to administer. They also lack robustness across situations (i.e., a new test must be developed for each experimental scenario). Together with the present investigation, some recent research efforts have explored the use of more subjective alternatives to traditional methods of measuring SA objectively (Matthews, Beal, & Pleban, 2002; Strater, Endsley, Pleban, & Matthews, 2001).

In the second case, while attempting to categorize and quantify radio transmissions in previous investigations of the relationship between various small-unit radio TTPs and SA (Christ & Evans, 2001; Dismounted Battlespace Battle Lab & Marine Corps Warfighting Lab, 1999; Redden & Blackwell, 2001), observers noticed that some squad leaders appeared to have greater SA than others, based solely on the nature and content of their radio communication with superiors, peers, and subordinates. The present research effort is an attempt to quantify this earlier behavioral observation. We seek to eventually develop communication-based measures of SA that will reliably differentiate the performance of small unit leaders and will closely mirror the psychometric properties of more objective SA measures.

The present report is organized around two separate, though interrelated, research efforts. First, we document the methodological development of two communication-based SA measures from a common pool of over 300 behavioral incidents. These measures are a behavioral checklist called the Radio Communications Checklist of Leader Awareness (RCCOLA) and a questionnaire called Future Expectations of Likely Leader Awareness (FELLA). Second, we present the results of a limited number of field trials of these measures that were conducted with Infantry squad leaders and their squads. In the last section of the report we discuss future potential uses of the two scales.

Development of Situation Awareness Measures

Our approach to developing communication-based SA measures involved the use of the critical incident technique, originally described by Flanagan (1954). Four retired military personnel were given a two-hour training workshop on how to write suitable incidents of communication behavior. This training stressed four characteristics of critical incidents: their behavioral nature, specificity, ability to differentiate among people, and clarity. Examples of both acceptable and unacceptable incidents were provided. The first few incidents written by each participant were critiqued and suggestions for improvement were offered. Over a subsequent period of several weeks, participants generated a pool of 318 behavioral incidents on their own, each intended to represent either outstanding, typical, or poor SA on the part of platoon or squad leaders. In addition to using their own experience, the four item authors consulted a variety of publications to stimulate thought about item content and to widen the conceptual coverage of the item pool. These publications included doctrinal manuals (Department of the Army, 1992, 1994), the results of a recent SA requirements analysis (Strater et al., 2001), various bulletins and reports of the Center for Army Lessons Learned, as well as Combat Training Center compendia.

After editing to create a common style, the 318 behavioral incidents were given to a group of 24 independent evaluators. Each evaluator was asked to judge whether or not each item reflected the SA of small unit leaders. If they judged an item as being related to the concept of SA, they were also asked to indicate whether the item suggested outstanding, typical, or poor SA. The questionnaire used in the independent evaluation is shown in Appendix A. The group of independent evaluators included active duty military personnel ($n = 9$), retired military personnel ($n = 7$), and civilian scientists familiar with military field research ($n = 8$). Table 1 shows the level of agreement on item content between the item authors and the independent evaluators. Generally, items written to reflect poor or typical levels of leader SA were viewed as such by a majority of the independent evaluators. However, items written to reflect outstanding SA were, more often than not, seen as reflecting a typical level of SA. This effect was strongest among the active duty military evaluators.

Table 1
Number of Items Classified by Item Authors and Independent Evaluators
as Outstanding, Typical, and Poor SA

		Intent of Item Authors		
		Outstanding	Typical	Poor
Majority Rating of Independent Evaluators	Outstanding	28	1	1
	Typical	91	60	11
	Poor	1	20	105
	Total	120	81	117
	Agreement %	23.33	74.07	89.74

After the results of the independent evaluation were tabulated, the 318 items were sorted according to their level of evaluator agreement, from highest to lowest. There were 28 items that fewer than 20 independent evaluators thought reflected some level of SA. These were eliminated from any further consideration. An additional 108 items were eliminated because the majority of evaluators disagreed with the intent of the item authors. For example, 17 of the evaluators thought item 40 represented an outstanding level of leader SA, while six thought it represented a typical level of SA, and one was not convinced it represented SA at all. This item was dropped because the authors had intended it to reflect a typical level of SA. For each SA level, the 20 items having the greatest independent evaluator agreement were selected for inclusion in the RCCOLA and FELLA scales. Agreement statistics for the 60 chosen items are shown in Table 2.

Table 2
Mean Percentage of Evaluator Agreement for 20 Items Representing
Each of Three Levels of SA

Item SA Level	Mean % of Evaluators Who Thought Items Related to SA	Mean % of Evaluators Who Agreed with Author's Intent about SA Level
Outstanding	93.12	63.33
Typical	91.87	82.92
Poor	91.46	88.96

Radio Communications Checklist of Leader Awareness

As shown in Appendix B, the 60 items selected as a result of the independent evaluation were formed into a behavioral checklist titled the Radio Communications Checklist of Leader Awareness (RCCOLA). This SA measure was designed to enable observers to record the occurrence of SA-related communication behaviors in real time while listening to the squad and platoon radio networks of a squad leader. Similarly, RCCOLA items were designed to be suitable for the assessment of platoon leader SA, by listening to company and platoon radio networks. Every time a particular behavior was heard, observers or raters would place a checkmark next to that item on the checklist. Thus, it was possible for each RCCOLA item to receive multiple checkmarks, one for each occurrence of a particular behavior.

Items representing outstanding, typical, and poor SA were segregated and then grouped into four temporal categories: planning/preparing, movement, actions on enemy contact, and miscellaneous. These categories were chosen to hasten the ratings process under real-time conditions, making it easier for observers to locate particular items as a mission unfolds. The categories were not thought to be underlying factors of an SA construct. The miscellaneous category included items that could occur at any time during a mission. For each trial or mission, the RCCOLA measure is scored as follows:

$$\frac{\text{number of outstanding checkmarks} - \text{number of poor checkmarks}}{\text{total number of outstanding, typical, and poor checkmarks}}$$

Possible RCCOLA scores can range from -1 to +1, with a score of 0 indicating a typical level of SA for squad leaders.

Future Expectations of Likely Leader Awareness

The same 60 items selected from the independent evaluation were also formed into what we called the Future Expectations of Likely Leader Awareness (FELLA) scale (see Appendix C). Unlike the RCCOLA measure, the FELLA scale was designed to be completed at the end of an experimental trial or operational mission. Further, the FELLA items were listed in random order, without grouping them into categories. The FELLA scale was designed to be more future oriented and subjective than the RCCOLA measure, asking raters their expectations of the likelihood of particular leader behaviors occurring in subsequent missions.

The 60 FELLA items were scored on a seven-point Likert scale ranging from "Highly Unlikely" (1) to "Highly Likely" (7), with the scale's midpoint being "Hard to Say" (4). The 20 items representing a poor level of leader SA were reverse scored. An overall FELLA scale score was obtained by calculating the mean of the 60 items. Thus, possible overall scores could range from 1 to 7.

Global SA Assessment Item

Finally, a global assessment item was added to the end of the FELLA scale. This item asked raters about their overall expectations of a leader's SA level in future missions. The global assessment item was scored on a seven-point Likert scale ranging from "Poor" (1) to "Outstanding" (7), with "Center of Mass" being the midpoint anchor. If a large enough leader sample could be obtained in future experimentation, this item could help to determine the relative contribution of particular leader behaviors to the overall concept of SA.

Evaluation of Situation Awareness Measures

Field trials using the RCCOLA checklist and the FELLA scale were conducted as part of a larger field experiment investigating the degree to which squad radios enhanced soldier SA. Sponsored by the Military Operations in Urban Terrain (MOUT) Advanced Concept Technology Demonstration (ACTD) program, this experiment was a direct follow-on effort to an earlier experiment whose results have already been reported in detail (Christ & Evans, 2002; Redden & Blackwell, 2001). The earlier experiment involved the use of experienced squads conducting offensive and defensive missions in an urban environment, where squad members maintained direct visual contact with each other much of the time. In contrast, the present experiment involved the use of relatively inexperienced squads conducting reconnaissance and link-up missions in a largely wooded environment, where the squad's two teams were geographically

separated from each other most of the time. Each team approached a fenced compound from different directions, where they were instructed to surreptitiously report any activities of observed enemy and civilian personnel. Later, the teams linked up at a designated checkpoint, which served as another site for the observation and reporting of enemy and civilian activities.

Research Participants

Research participants were seven squad leaders, each having two teams of either three or four men each. Most of these squad leaders were relatively inexperienced, either having been recently assigned to the squad or having been assigned to a temporary squad leadership position. In some cases, squad leaders had no prior field training experience with their squads. Our research focused only on the SA of the squad leaders, as reflected in their radio communications with squad members and with a simulated platoon leader. The platoon leader's role was played by an experimenter whose outgoing radio transmissions were largely dictated by a rehearsed mission script for each trial.

Measures and Raters

A team of two retired Infantry officers served as independent raters, each completing a separate RCCOLA checklist during each trial, as well as a separate FELLA scale and global assessment item immediately after the completion of each trial. One member of the rating team participated in rating all seven squad leaders. The second member of the rating team rated only the first three squad leaders. A third retired Infantry officer served as the second rater for the last four squad leaders. Finally, a civilian member of the research staff separately logged the number and types of radio transmissions heard over the squad and platoon radio networks using a real-time categorization scheme described by Christ and Evans (2002). Specifically, each squad and platoon radio transmission was logged into one of 15 mutually exclusive categories: Provide Acknowledgment, Provide Direction, Provide Information (Friendly), Provide Information (Threat), Provide Opinion, Request Acknowledgment, Request Direction, Request Information (Friendly), Request Information (Threat), Request Opinion, Unrelated to Mission, Administrative/Other, Inaudible, Break Squelch, or Hot Microphone.

Procedure

Each of the seven squad leaders completed six trials. Consequently, each SA measure was used during each of the 42 separate trials. The average duration of each trial was 41 minutes, with the reconnaissance portion requiring an average of 20 minutes and the link-up portion requiring an average of 21 minutes. Each squad leader's first three trials were conducted during daylight hours and their last three trials were conducted at night. All trials for an individual squad leader were completed over a 12-hour period. For scheduling reasons, the order of day and night trials was not counterbalanced across squad leaders, so visibility level was not a factor analyzed in this experiment.

There were three squad radio conditions evaluated in the experiment, with each day and night trial having a different squad radio condition. One day trial and one night trial for each squad leader was conducted without squad radios. In this baseline condition, the squad leader

used a radio only to communicate with the platoon leader. On all other trials, the squad leader had two radios, one to communicate with his squad members and the other to communicate with the platoon leader. In the second squad radio condition, only the squad leader could initiate transmissions over the squad radio. Squad members could listen and acknowledge the receipt of a squad leader transmission, but could not initiate transmissions themselves. In the third squad radio condition, squad members were free to initiate transmissions at any time, either to their squad leader or to other squad members. The order of these squad radio conditions was largely counterbalanced across trials. Three different Opposing Force (OPFOR) scripts and two different lanes of movement were used alternately across trials, insuring that each squad leader encountered a novel set of circumstances on each of his six trials.

Results

Due to the relatively small sample of squad leaders ($n = 7$) and the variability in their performance across trials, our analyses were based principally on the use of descriptive statistics. As shown in Table 3, the performance of the squad leaders, averaged across raters and trials, tended to fall within the middle and lower ranges of our three SA measures.

Table 3
Mean Scores of Two Raters for Three SA Measures

SA Measure	<i>M</i>	<i>SD</i>	Potential Range	Actual Range
RCCOLA Checklist	-0.18	0.33	-1.00 to +1.00	-1.00 to +0.55
FELLA Scale	4.04	0.79	1.00 to 7.00	2.24 to 5.96
Global Assessment Item	3.04	1.38	1.00 to 7.00	1.00 to 6.00

Note. RCCOLA = Radio Communications Checklist of Leader Awareness. FELLA = Future Expectations of Likely Leader Awareness. Table entries are based on six trials for each of seven squads.

The percentage of interrater agreement on our three measures was found to be generally high, as shown in Table 4. A plot of RCCOLA total scores for the two raters across 42 trials is shown in Figure 1. The integers shown in the body of Figure 1 are squad leader numbers. Each squad leader is shown six times, once for each trial. Some squad leaders demonstrated a fairly consistent level of performance across trials (e.g., Squad Leader 5), while others were highly inconsistent (e.g., Squad Leader 1).

Table 4
Percentage of Interrater Agreement Across Items and Trials

SA Measure	<i>N</i>	% of Identical Item Scores Between Raters	% of Nearly Identical Item Scores (+/- 1)
RCCOLA Checklist	2520	91.3	97.5
FELLA Scale	2520	52.9	84.4
Global Assessment Item	42	59.5	100.0

Note. RCCOLA = Radio Communications Checklist of Leader Awareness. FELLA = Future Expectations of Likely Leader Awareness.

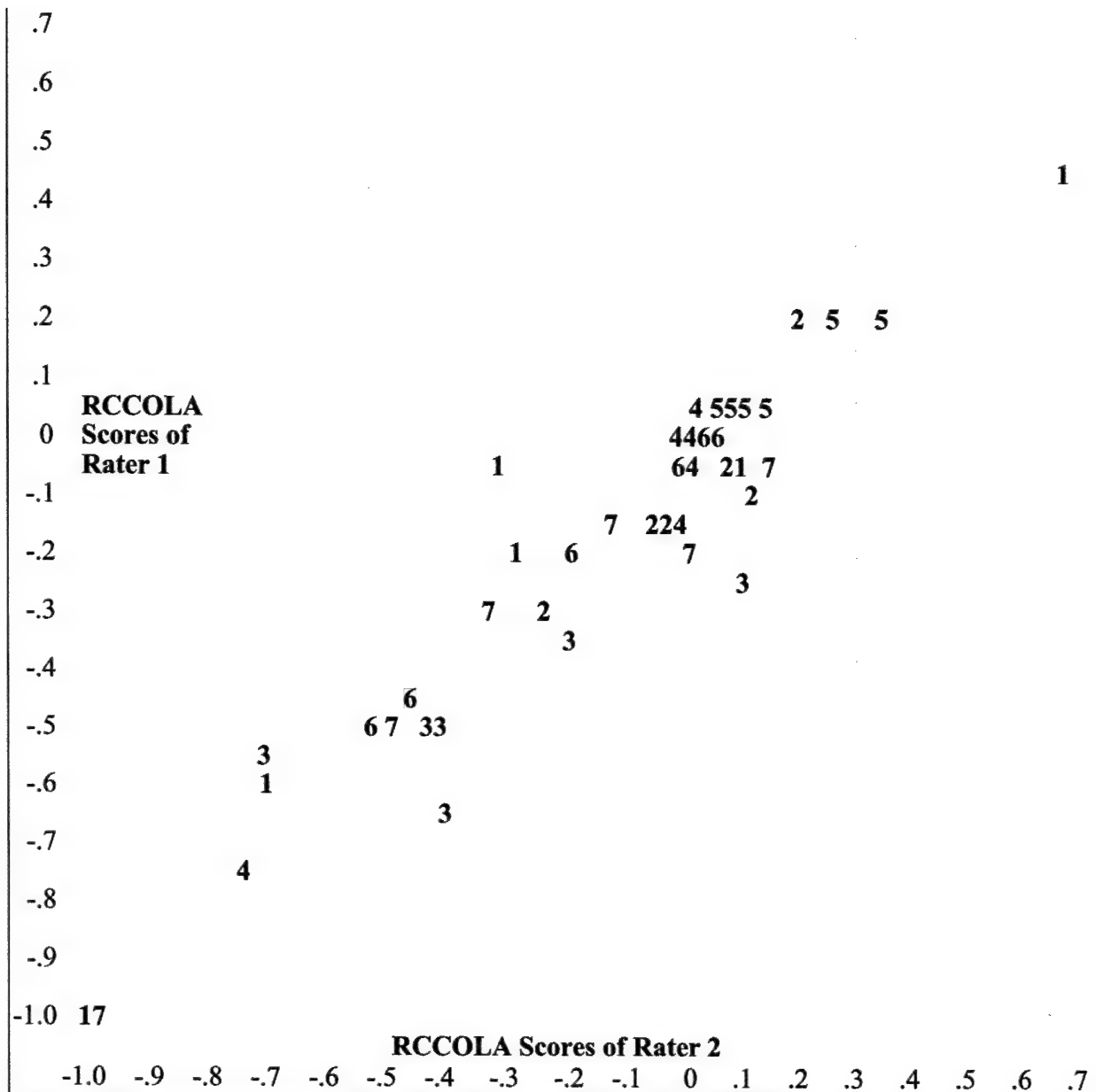


Figure 1. A comparison of the RCCOLA scores obtained from two raters across 42 trials (six trials for each of seven squad leaders).

Although we had no expectation that all RCCOLA items could be observed during the course of every conceivable type of mission, we found that 23 of the 60 items (38%) were never observed by either rater during our field trials. These unobserved items included 12 of the 20 outstanding SA items (60%), 2 of the 20 typical SA items (10%), and 9 of the 20 poor SA items (45%). Most of these unobserved items can be attributed to the nature of the reconnaissance and link-up mission scenarios used in the present experiment. Because squads were expected to observe the enemy without being detected and to refrain from engaging them with weapons,

RCCOLA items involving ammunition resupply, fire control, and casualty evacuation behaviors were unlikely to occur. However, there were also a few RCCOLA items that could conceivably have occurred, but were just never observed among the squad leaders in our sample (e.g., "treats a sound recommendation or advice from subordinates as an interruption and takes no action"). The frequency with which each RCCOLA item was observed is shown in Appendix D.

During the course of data collection, raters noticed it was harder to form an opinion about a squad leader's level of SA on baseline trials, when no squad radio was used. This anecdotal finding was supported by a comparison of the average number of items receiving a rating of four on the FELLA scale across the experimental radio conditions. When no squad radio was used, 45 of the 60 items were rated as "hard to say" by the two raters on average. When a squad radio was used, with squad members listening but not transmitting, the average number of items rated as "hard to say" fell to 21. That number was reduced even further, to 18, when squad members were allowed to freely transmit. These overall differences across conditions were found to be statistically significant, $F(2,12) = 42.41, p < .0001$. Pairwise comparisons using the Least Significant Difference Test indicated that both squad radio conditions were significantly different from the no squad radio condition ($p < .001$), though the two squad radio conditions were not significantly different from each another.

Though it did not approach statistical significance, there was a small consistent trend among the squad radio conditions and our three communication-based SA measures (see Table 5). For each measure, the highest SA scores were obtained during trials when a squad radio was used, particularly when squad members were allowed to transmit freely. In addition, significantly greater numbers of audible squad radio transmissions occurred during these trials, $F(1,6) = 22.24, p < .001$.

Table 5
Mean Scores of Three SA Measures and Mean Number of Radio Transmissions
for Three Squad Radio Conditions

Squad Radio Condition	SA Measure			Audible Squad Radio Transmissions <i>M (SD)</i>
	RCCOLA <i>M (SD)</i>	FELLA <i>M (SD)</i>	Global Item <i>M (SD)</i>	
No Squad Radio	-0.21 (.49)	4.00 (.39)	2.89 (1.44)	none
Squad Radio (only SL could transmit)	-0.21 (.08)	4.01 (.87)	3.04 (1.45)	37.29 (6.91)
Squad Radio (SL & squad members could transmit)	-0.11 (.06)	4.11 (1.03)	3.18 (1.34)	124.64 (26.35)

Note. RCCOLA = Radio Communications Checklist of Leader Awareness. FELLA = Future Expectations of Likely Leader Awareness. There were 14 trials for each squad radio condition, one day trial and one night trial for each squad leader.

Discussion

Although the size of our squad leader sample limits the conclusions one can draw from the field trials, the findings obtained were largely positive. Our communication-based measures of SA appear to have a sufficient level of interrater agreement. Additionally, they possess a certain measure of content-related validity based on the way they were constructed (i.e., SMEs had to agree that items reflected leader SA in order to be included on the RCCOLA checklist and FELLA scale). The measures also appear sensitive to differences in the way squad radios were used (e.g., whether or not squad members were allowed to transmit). For these reasons, we recommend the use of the RCCOLA checklist and FELLA scale in future research, field exercises, and virtual training environments where radio transmissions of small unit personnel can be monitored. Further research is needed to increase the sample of small unit leaders, to determine the relationship of communication-based measures to more objective measures of SA, and to gauge their utility for a wider variety of soldier missions.

Raters had more difficulty using the FELLA scale than they did the RCCOLA checklist. The FELLA scale required a greater number of discrete decisions to be made and it required the rater to estimate or predict the likelihood of future events based on events in the recent past. These decisions and estimates had to be made within a time limit of approximately 15 minutes, indirectly imposed by the pace with which experimental trials were run. In contrast, the RCCOLA checklist only required the rater to note how often specific behaviors occurred during the course of a mission. The FELLA scale was also more difficult to use because the wording of several of its items was found to be confusing (e.g., was it highly unlikely "this SL could be expected not to report being in a danger area or could be expected to take no action to avoid it?"). Future use of the FELLA scale should consider small wording changes to help clarify the intended meaning of these problematic items, even if the integrity of the original wording has to be compromised. While the FELLA scale was intended to be more of a research tool, for use in item analysis and factor analytic studies of the instrument's underlying content and structure, the FELLA scale could also be used in situations where raters cannot rely on real-time methods of leader evaluation.

Based on informal conversations held with squad leaders before their first trial, we knew our sample was not representative of Infantry squad leaders overall. In particular, our sample was notably inexperienced. As a result, the performance of many squad leaders was erratic over trials and the upper levels of the communication-based SA measures were rarely used. Future research with these measures should seek to broaden the squad leader sample in terms of their experience, as well as extend the sample to platoon leaders, a group for which most of our behavioral items should still apply. It should also be noted that the methods used to create the SA instruments described in the present report could be easily applied to other occupations where personnel routinely communicate via radio (e.g., police, fire, and paramedic organizations).

As squad and platoon radios become more common items of equipment within small units, the ability of our soldiers to communicate effectively with each other will become a critical factor influencing their ultimate level of combat effectiveness. In the past, when most small unit personnel did not communicate with radios, this was an issue rarely addressed in after-action reviews (AARs) of unit performance. This situation needs to change in a hurry. How squad

members contribute, or fail to contribute, to the SA of their squad and platoon leaders is an AAR topic that needs more emphasis. Similarly, we also need to understand and emphasize how the communication behaviors of small unit leaders contribute or detract from the situational understanding of their subordinates. Before the promise of better small unit communication can be realized, however, we must get trainers and observer/controllers to routinely monitor squad and platoon radios during field exercises and training center rotations. Once optimal squad and platoon radio communication procedures have been identified, they need to be formally introduced into appropriate institutional courses for the benefit of junior leaders. We believe that communication-based measures of SA, such as those explored in the present report, can serve an important role in improving the communication practices and resulting levels of situational understanding among all soldiers at the small unit level.

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Appendix A
Independent Evaluation Questionnaire

The purpose of this exercise is to employ your expertise in identifying and rating audible leader behaviors that could be used to evaluate leader situation awareness (SA). Each item in the following list is a platoon or squad leader behavior that might conceivably be heard over the course of one or more radio transmissions. Your task is to rate each item according to how well it reflects a leader's SA. If you can't see how a particular item relates to leader SA, then *skip* that item. We expect each of you will encounter some items you cannot rate. However, when you see an item that appears related to SA, rate whether you think the described behavior seems to be indicative of *poor*, *typical*, or *outstanding* leader SA, by putting a check mark in the appropriate column. Rate an item as *typical* when you think the behavior reflects the level of SA found in most small unit leaders. Items rated as *poor* or *outstanding* should represent a level of SA that is either well below or well above a center-of-mass rating for this group of leaders.

Although some items are highly similar, please consider each item carefully. An item's relationship to leader SA may be subtle, at best. Also note that we are *not* asking you to rate whether items reflect a leader's technical competence, tactical judgment, or overall effectiveness, just a leader's SA. For example, a platoon leader with outstanding SA may still be viewed as largely ineffective, resulting from his lack of some important troop leading skills. Finally, because our list of items is rather long, *do not* attempt to rate the entire list in one sitting. Rather, try to complete a page or two whenever your mind is fresh. We welcome your comments and suggestions in any format at any time, particularly about areas of communications-based SA we may have overlooked. Thanks!

Acronym List

FRAGO	Fragmentary Order
LP/OP	Listening Post / Observation Post
MOPP	Mission Oriented Protective Posture (NBC equipment)
OCOKA	Observation and fields of fire, Cover and concealment, Obstacles, Key terrain, Avenues of approach
OPORD	Operations Order
SITREP	Situation Report
SOP	Standing Operating Procedure

#	Behavior		Poor	Typical	Outstanding
1	After receiving a change in mission, the leader announces a movement formation or movement technique inconsistent with the reported likelihood of enemy contact and/or need for speed.				
2	At the request of the higher element, the leader does not report vulnerability to enemy activity in his area.				
3	In order to provide enemy information to the higher element, the leader requests information from subordinates.				
4	In providing SITREPs to the higher element while actively engaged with the enemy, the leader can usually present an accurate disposition of friendly and threat forces.				
5	In providing SITREPs to the higher element while actively engaged with the enemy, the leader presents the future likelihood of threat courses of action.				
6	Leader acknowledges sound advice/recommendation from subordinates.				
7	Leader advises lead element of impending course change during movement.				
8	Leader allows sufficient time for subordinates to accomplish assigned tasks.				
9	Leader answers radio call after his radio operator makes initial responses during enemy contact.				
10	Leader anticipates activity and locates himself at the best position to control his unit.				
11	Leader anticipates noncombatant actions within his area and directs elements to be prepared to respond.				
12	Leader anticipates the need for night observation devices and requires subordinates to conduct pre-combat inspection and mount them at last light for night operations.				
13	Leader anticipates the need for night observation devices and requires subordinates to conduct pre-combat inspection and mount them while still daylight in preparation for night operations.				
14	Leader applies his mission's operational graphics control measures to reference his current tactical situation.				
15	Leader approves a change in unit movement formation after subordinate notifies him that they have encountered different type of terrain.				
16	Leader asks questions of a subordinate to get a complete SITREP but subordinate does not provide all information.				
17	Leader assigns subordinates tasks to perform based on their personnel strengths and weaknesses.				
18	Leader assigns subordinates tasks to perform regardless of their personnel strengths and weaknesses.				
19	Leader attempts to establish an alternate means of communications when the primary means of communications is lost with a subordinate.				
20	Leader becomes lost during movement.				
21	Leader calls support/attached elements only when he needs support.				
22	Leader cannot be reached on the radio during enemy contact, despite repeated attempts to contact him.				
23	Leader changes/adjusts movement formations based on likelihood of enemy contact.				
24	Leader changes/adjusts movement formations only after enemy contact.				
25	Leader conducts spot-checks to insure that his instructions are being carried out only after inadvertently finding a discrepancy.				

#	Behavior		Poor	Typical	Outstanding
26	Leader continues an operation regardless of the chances of success or failure.				
27	Leader continues the operation "to the last man" and does not inform higher.				
28	Leader continues to try and accomplish the assigned mission even when his unit sustains too many casualties.				
29	Leader continues with an operation until his unit is not combat effective and then informs higher.				
30	Leader controls his unit based only on suggestions and observations of subordinates because he is unable to determine what is happening.				
31	Leader conveys a complete picture of the current situation to his subordinates.				
32	Leader conveys an accurate picture of the current situation to his subordinates.				
33	Leader conveys an accurate picture of the situation after answering some questions from subordinates.				
34	Leader conveys an incomplete picture of the situation and must answer some questions.				
35	Leader conveys only a portion of the commander's intent to subordinates during a change of mission order.				
36	Leader conveys the commander's intent to subordinates during a change of mission order.				
37	Leader correctly distinguishes locations of friendly, enemy, and noncombatant elements within his area.				
38	Leader correctly identifies weakest enemy point.				
39	Leader directs a "be prepared" order to subordinates, after receiving planning directions from higher element.				
40	Leader directs a change from the planned route based on change to enemy situation or first-hand observation of terrain.				
41	Leader directs a change in MOPP based on a change of threat.				
42	Leader directs a change in MOPP based on commander's guidance, orders, or the SOP.				
43	Leader directs a change in planned ongoing operations to respond to an unanticipated, but apparent noncombatant situation in the area.				
44	Leader directs a change in unit movement formation based on knowledge that the terrain they are approaching is about to change.				
45	Leader directs a change in unit movement formation because the terrain they just encountered has changed.				
46	Leader directs a soldier to take charge of an element when he is informed that the element leader is a casualty.				
47	Leader directs a subordinate element to move to a new position from their present one, without ever previously asking them to report their location.				
48	Leader directs a unit to continue a mission when the unit has become ineffective.				
49	Leader directs allocation of critical resources to the element that should have priority for the resources.				
50	Leader directs continued movement of his force in same manner and direction even while receiving enemy fires.				
51	Leader directs cross leveling of critical resources among all elements when one element should have priority for the resources.				
52	Leader directs fires on enemy locations outside his assigned sector without coordination with his higher or adjacent units.				

#	Behavior	Poor	Typical	Outstanding
53	Leader directs his subordinates to vacate or move away from an area or terrain that allows enemy to gain an advantage over the friendly force.			
54	Leader directs movement of his force away from incoming enemy fires.			
55	Leader directs movement of his force to avoid enemy fires.			
56	Leader directs periodic halts during movement to adjust equipment/change socks.			
57	Leader directs replacement of a critical individual who has become a casualty.			
58	Leader directs security element to move to a specific location/area based on determination that enemy likelihood is greater in that location/area. (Offense)			
59	Leader directs subordinate to establish LP/OP at most likely enemy avenue of approach. (Defense)			
60	Leader directs subordinate to establish LP/OP in his sector, without specifying locations. (Defense)			
61	Leader directs subordinate to take an action that distracts the enemy from the friendly unit main effort or action.			
62	Leader directs subordinate to take an action that draws enemy attention to the friendly unit main effort or action.			
63	Leader directs subordinates to break enemy contact because cost of fighting the enemy is higher than the benefit.			
64	Leader directs subordinates to conduct communication checks before mission begins.			
65	Leader directs subordinates to conduct communication checks during the planning phase of the mission.			
66	Leader directs subordinates to continue actions because the mission is not yet fully accomplished/complete.			
67	Leader directs subordinates to continue fight with enemy even when costs outweigh benefit.			
68	Leader directs subordinates to evacuate casualties and prisoners without specifying a route.			
69	Leader directs subordinates to follow a route that provides cover and concealment from the enemy.			
70	Leader directs subordinates to halt actions before the mission is accomplished/complete even though sufficient resources are available to continue the mission.			
71	Leader directs subordinates to take control of or capture an area or terrain that will provide his unit an advantage over the enemy.			
72	Leader directs that no subordinates relocate even when a subordinate element notifies him that assistance or reinforcement is needed to accomplish the mission.			
73	Leader directs the relocation of a subordinate element to assist or reinforce a friendly element that needs assistance.			
74	Leader directs the relocation of a subordinate element to be prepared to assist or reinforce an expected weakness by another friendly element.			
75	Leader directs the replacement of a critical individual who has become a casualty after prompting by a subordinate.			
76	Leader directs the replacement of a critical individual who has become a casualty only after prompting by a superior.			
77	Leader directs use of a security element, but does not specify a location/area based on likely enemy location/area. (Offense)			

#	Behavior		Poor	Typical	Outstanding
78	Leader displays evidence of a change in enemy or friendly situation by modifying weapons control status.				
79	Leader displays evidence of a change in enemy or friendly situation or a hazard presented by a situation by reminding subordinate units of conditions under which the "rules of engagement" may be modified.				
80	Leader displays evidence of a change in enemy or friendly situation or a hazard presented by a situation by reminding subordinate units of the "rules of engagement".				
81	Leader displays evidence of a change in enemy or friendly situation or a hazard presented by a situation by requesting a modification to the "rules of engagement".				
82	Leader displays evidence of a change in enemy threat by issuing a FRAGO to modify a subordinate unit's mission or task during the operation.				
83	Leader displays evidence of a change in enemy threat or the friendly situation by assigning a "be prepared" mission to a subordinate unit or a crew served weapon.				
84	Leader displays evidence of a change in enemy threat or the friendly situation directing a change in sectors of fire for a subordinate unit or a crew served weapon.				
85	Leader displays evidence of a change in threat or danger to his unit by directing the lifting or shifting of supporting indirect fires.				
86	Leader displays evidence of a change in threat or danger to his units by directing the lifting or shifting of supporting direct fires.				
87	Leader displays evidence of a potential fratricide hazard by warning units of a friendly aircraft moving through the area.				
88	Leader displays evidence of a potential fratricide hazard by warning units of a friendly ground unit moving through the area.				
89	Leader displays evidence of fire control measures and a change in threat or danger to his unit by recommending the lifting or shifting of supporting fires in an adjacent sector.				
90	Leader displays evidence of his knowledge of how the current weather conditions will impact the operation.				
91	Leader displays evidence of his knowledge of the enemy capabilities and terrain appreciation by failing to inform subordinate units of enemy activities in an area capable of observing or bringing direct fire on unit positions or activities.				
92	Leader displays evidence of his knowledge of the enemy capabilities and terrain appreciation by informing subordinate units of enemy activities in an area from which they are capable of bringing direct fire on unit positions or activities.				
93	Leader displays evidence of his knowledge of the enemy capabilities and terrain appreciation by informing subordinate units of enemy activities in an area from which they are capable of observing unit positions or activities.				
94	Leader displays evidence of his knowledge of the enemy capabilities and terrain appreciation by informing subordinate units of nearby enemy activities.				

#	Behavior		Poor	Typical	Outstanding
95	Leader displays evidence of his knowledge of the enemy or friendly situation by directing relocation of a supporting weapon system or unit once it is unable to perform its mission.				
96	Leader displays evidence of his knowledge of the enemy or friendly situation by directing relocation of a supporting weapon system or unit that is unable to perform its mission when prompted by a subordinate.				
97	Leader displays evidence of his knowledge of the enemy or friendly situation by failing to direct relocation of a supporting weapon system or unit that is reported as unable to perform its mission.				
98	Leader displays evidence of his knowledge of the enemy or friendly situation by relieving or replacing a unit or element before it has become ineffective.				
99	Leader displays evidence of his knowledge of the enemy or friendly situation or hazards present by directing surveillance of a specific area or location.				
100	Leader displays evidence of his knowledge of the enemy or friendly situation or hazards present by directing units to modify current positions or locations to provide for surveillance of a specific area or location.				
101	Leader displays evidence of his knowledge of the enemy or friendly situation or hazards present by recommending an avenue of approach or route to his location.				
102	Leader displays evidence of his knowledge of the enemy or friendly situation or hazards present by recommending or directing a landing zone for an approaching helicopter.				
103	Leader displays evidence of his knowledge of the enemy or friendly situation or hazards present by verifying the protective status or precautions taken during civilian movement in or near the unit area.				
104	Leader displays evidence of his knowledge of the enemy or friendly situation or hazards present by warning units of civilian movement in the area.				
105	Leader displays evidence of his knowledge of the friendly situation by providing an update on the status of injured soldiers or victims of an accident or combat action.				
106	Leader displays evidence of his knowledge of the terrain by requesting additional support for preparing positions.				
107	Leader displays evidence of his lack of knowledge of the enemy's superior capabilities by exposing his unit to enemy fires to recover wounded.				
108	Leader displays evidence of his lack of knowledge of the terrain by not requesting additional support for preparing positions, even when support is needed to accomplish the mission.				
109	Leader displays evidence of his lack of knowledge of the terrain by rejecting a higher element offer for additional support for preparing positions.				
110	Leader displays evidence of his lack of understanding of the time constraints on subordinates by failing to prioritize specific tasks.				
111	Leader displays evidence of his lack of understanding of the time needed for completing the assigned movement.				
112	Leader displays evidence of his lack of understanding of the time needed to accomplish assigned tasks during actions on the objective.				

#	Behavior		Poor	Typical	Outstanding
113	Leader displays evidence of his understanding of the time constraints on subordinate units by prioritizing the effort to be expended on specific tasks.				
114	Leader displays evidence of his understanding of the time needed for completing the assigned movement.				
115	Leader displays evidence of his understanding of the time needed for subordinate unit preparation by providing subordinate units with 2/3 of the available time.				
116	Leader displays evidence of his understanding of the time needed to accomplish assigned tasks during actions on the objective.				
117	Leader displays extreme stress during an extremely tense situation and must be prompted to respond.				
118	Leader displays signs of frustration when subordinates fail to accomplish assigned tasks in the time allowed.				
119	Leader displays signs of stress during an extremely tense situation and responds appropriately.				
120	Leader disseminates mission-essential information or factors impacting current mission, as well as other non-essential information to subordinates.				
121	Leader disseminates only mission-essential information or factors impacting current mission to subordinates.				
122	Leader does not allow sufficient time for subordinates to accomplish assigned tasks.				
123	Leader does not ask for further information from a subordinate who provides an incomplete SITREP.				
124	Leader does not convey a complete picture of the situation even after answering questions.				
125	Leader does not convey an accurate picture of the situation even after answering questions.				
126	Leader does not convey the commander's intent to subordinates during a change of mission order.				
127	Leader does not direct a "be prepared" order to subordinates, even after receiving planning directions from higher element that mandate an order.				
128	Leader does not direct subordinates to conduct a communication check prior to an operation.				
129	Leader does not issue "be prepared" orders after receiving guidance from higher to do so.				
130	Leader does not notify appropriate personnel of the meaning of signals that are being used during an operation.				
131	Leader does not notify subordinates of a friendly aircraft moving through the area, which could lead to fratricide.				
132	Leader does not notify subordinates of a friendly ground unit moving through the area, which could lead to fratricide.				
133	Leader does not recognize subordinate physical and/or mental exhaustion until a soldier needs medical attention.				
134	Leader does not report that his unit is at a danger area or takes no action to avoid it.				
135	Leader does not take action to establish alternate means of communication when the primary means of communications is lost with a subordinate.				
136	Leader does not warn subordinates of civilian movement in the area.				

#	Behavior		Poor	Typical	Outstanding
137	Leader ensures that all appropriate personnel know the signals that are about to be used during an operation.				
138	Leader establishes lateral coordination with peers or adjacent units.				
139	Leader explains how to execute a task or drill that his unit knows and subordinates must remind him that they are already trained.				
140	Leader fails to anticipate the need for night observation devices and begins night operations without them.				
141	Leader fails to assign subordinates tasks to perform because no one is capable of performing them to standard.				
142	Leader fails to change/adjust movement formations even with evidence of likely enemy contact.				
143	Leader fails to designate a new element leader when one of them becomes a casualty.				
144	Leader fails to direct any reallocation of critical resources.				
145	Leader fails to direct the replacement of a critical individual who has become a casualty.				
146	Leader fails to disseminate or inadequately disseminates mission-critical change of mission information or factors impacting current mission to subordinates.				
147	Leader fails to employ security because he does not recognize likely enemy location/area. (Offense)				
148	Leader fails to establish lateral coordination with peers or adjacent units jeopardizing his time/space relationship to his mission.				
149	Leader fails to follow reporting requirements specified in OPORD.				
150	Leader fails to keep support/attached elements informed of his location until movement is completed.				
151	Leader fails to maintain friendly battle tracking of subordinate combat forces.				
152	Leader fails to or inadequately applies his mission's operational graphics control measures to refer to his current tactical situation.				
153	Leader fails to provide or provides inadequate guidance to subordinates on mission-critical constraints or limitations during a change in the tactical situation.				
154	Leader fails to provide subordinates with sufficient time to accomplish assigned tasks during actions on the objective until subordinate requests additional time.				
155	Leader fails to provide subordinates with sufficient time to accomplish assigned tasks during actions on the objective.				
156	Leader fails to provide subordinates with sufficient time to accomplish assigned tasks during movement until subordinate requests additional time.				
157	Leader fails to provide subordinates with sufficient time to accomplish assigned tasks during planning and preparation until subordinate requests additional time.				
158	Leader fails to provide subordinates with sufficient time to accomplish assigned tasks during planning and preparation.				

#	Behavior	Poor	Typical	Outstanding
159	Leader fails to react immediately to recommendations/advice from subordinates.			
160	Leader fails to react to additional intelligence on any one of the critical factors of mission, enemy, terrain, troops, time, and civilians.			
161	Leader fails to react to an enemy attack or counterattack.			
162	Leader fails to recognize evidence of a change in threat or danger to his unit by failing to direct the lifting or shifting of supporting direct fires until lower element submits request.			
163	Leader fails to recognize evidence of a change in threat or danger to his unit by failing to direct the lifting or shifting of supporting indirect fires until lower element submits request.			
164	Leader fails to relay any elements of an enemy situation update that could impact on his unit's mission or situation.			
165	Leader fails to report personal/reported observations to higher element.			
166	Leader fails to request additional time or assets when an unrealistic task is assigned.			
167	Leader fails to rotate assigned tasks to subordinate units to avoid burnout.			
168	Leader fails to spot-check subordinates to insure that his instructions are being carried out even after finding a discrepancy.			
169	Leader fails to warn/remind subordinates of the time or location for a critical event and the event is missed.			
170	Leader follows reporting requirements as specified in the OPORD.			
171	Leader halts unit for a face to face discussion with lead element during movement.			
172	Leader has casualties and prisoners evacuated along a route to can be interrupted by enemy activity.			
173	Leader has periodic halts during movement to adjust equipment/change socks at the request of subordinates.			
174	Leader identifies friendly force locations and most enemy force locations.			
175	Leader informs higher that his unit is nearing a status of non-combat effective early enough so higher can react appropriately.			
176	Leader is given a change of mission and addresses any of the effects of terrain and weather on enemy and friendly forces using any aspects of OCOKA to accomplish his mission.			
177	Leader is not able to correctly identify enemy weak points.			
178	Leader is unable to locate enemy and noncombatant elements within his area.			
179	Leader issues "be prepared" orders only after receiving guidance from higher.			
180	Leader issues "be prepared" orders without guidance from higher.			
181	Leader keeps support/attached elements informed of his location during movement by ensuring that support elements report phase lines or position location to their parent units.			

#	Behavior		Poor	Typical	Outstanding
182	Leader maintains friendly battle tracking of subordinate combat forces.				
183	Leader modifies his current plan/activity in order to accommodate a situation that is evolving by an adjacent friendly unit after receiving directions to do so from a higher element.				
184	Leader modifies his current plan/activity in order to accommodate a situation that is evolving by an adjacent friendly unit.				
185	Leader moves forces to respond to an enemy attack or counterattack.				
186	Leader moves to the best position to control the unit after an activity has occurred.				
187	Leader must be prompted to follow reporting requirements specified in the OPORD.				
188	Leader must frequently ask subordinates to report their current positions.				
189	Leader must provide medical treatment to personnel because of insufficient halts during movement.				
190	Leader must repeatedly contact adjacent unit to determine situation so he can modify his current plan/activity to accommodate the friendly situation.				
191	Leader never requests adjacent unit information update when not provided by higher element.				
192	Leader notifies appropriate personnel of the meaning of signals that are currently being used during an operation.				
193	Leader notifies higher element that engineer support is needed to improve trafficability along a movement route.				
194	Leader notifies higher element that he is modifying his unit movement rate, either slower or faster, in order to keep the unit progress on the correct schedule.				
195	Leader notifies higher element that he must halt his unit operation due to exertion of soldiers.				
196	Leader notifies higher element that his unit failed to meet the required movement schedule.				
197	Leader notifies higher element that his unit is "lightening" load to be carried based on mission.				
198	Leader notifies higher element that his unit will most likely not be able to meet the prescribed movement schedule because the movement rate will not allow it.				
199	Leader notifies higher element that the enemy is defeated and then later changes his report.				
200	Leader obtains a complete SITREP from a subordinate, even if he must ask questions to obtain all needed information.				
201	Leader occasionally must ask subordinates to report their current positions.				
202	Leader orders a shift of indirect fires to facilitate friendly force action.				
203	Leader periodically requests adjacent unit information update if not provided by higher element.				
204	Leader plans for the effective use of time given the situation and circumstances.				
205	Leader plans personnel rotation to have best personnel at the appropriate location to complete critical tasks.				

#	Behavior		Poor	Typical	Outstanding
206	Leader presents a plan that acknowledges and accommodates the time constraints imposed.				
207	Leader presents a plan that will not accomplish the task in the time required.				
208	Leader projects future possible mission for his unit and directs a "be prepared" order to subordinates, without direction from higher element.				
209	Leader provides a change of mission warning to subordinate leaders upon notification from his higher headquarters.				
210	Leader provides immediate responses to subordinates' questions.				
211	Leader provides or recommends a visual reference or cue to supporting aviation units.				
212	Leader provides responses to subordinates' questions after a lengthy research time.				
213	Leader provides subordinates with sufficient time to accomplish assigned movement.				
214	Leader provides timely responses to subordinates' questions after minimal research time.				
215	Leader reacts immediately to recommendations/advice from subordinates.				
216	Leader reacts to additional mission-related intelligence.				
217	Leader reacts to noncombatant actions in his area.				
218	Leader recognizes and reacts to sound advice/recommendation from subordinates.				
219	Leader recognizes and reports his unit's arrival at a danger area, then avoids it or takes appropriate action.				
220	Leader recognizes subordinate physical and/or mental exhaustion and provides adequate breaks.				
221	Leader recognizes subordinate physical and/or mental exhaustion and provides sympathy/motivation.				
222	Leader recognizes subordinate's strengths and solicits advice when needed.				
223	Leader recognizes that his unit has moved into a danger area, he reports this, and then takes action to move through or out of the danger area.				
224	Leader recommends change/adjustment of plan to higher because of personal/reported observations.				
225	Leader relays a change of his company command post location to subordinates.				
226	Leader relays an enemy situation update complete as received from his higher headquarters.				
227	Leader relays only the elements of an enemy situation update which are in his unit's area of interest or that could impact his unit's mission or situation.				
228	Leader relays the observation of a visual signal executed during the current operation to subordinate units.				
229	Leader relies too heavily on the advice of others for decision making.				
230	Leader relocates forces to block anticipated enemy attack or counterattack.				
231	Leader remains calm during an extremely tense situation and responds in a timely manner.				
232	Leader reminds subordinates at the last minute of approaching time or location for a critical event.				

#	Behavior	Poor	Typical	Outstanding
233	Leader reminds subordinates of approaching time or location for a critical event.			
234	Leader renders all reports required by the current operation, on time, unsolicited.			
235	Leader renders all reports required by the unit SOP, on time, unsolicited.			
236	Leader renders most reports required by the current operation usually when solicited.			
237	Leader renders most reports required by the current operation, on time, unsolicited.			
238	Leader renders most reports required by the unit SOP usually when solicited.			
239	Leader renders most reports required by the unit SOP, on time, unsolicited.			
240	Leader repeatedly makes radio calls to subordinate without seeking other means to establish communication.			
241	Leader replaces a unit or element after it reports that it has become ineffective.			
242	Leader replaces a unit or element when it reports that it is becoming ineffective.			
243	Leader reports a change of his command post location after receiving a request from higher element.			
244	Leader reports a change of his command post location.			
245	Leader reports a disruptive or criminal act by a soldier, before taking corrective action to settle the situation.			
246	Leader reports a position or avenue of approach that provides some protection from anticipated enemy activity.			
247	Leader reports a position or some aspect of OCOKA that creates vulnerability of his unit to enemy activity.			
248	Leader reports encountering mines or obstacles along his unit route of movement and presents the operational impact or possible courses of action to overcome the impediment.			
249	Leader reports encountering mines or obstacles along his unit route of movement, but requires multiple transmissions or provides incorrect information.			
250	Leader reports encountering mines or obstacles along his unit route of movement.			
251	Leader reports enemy activity in his area to the higher element.			
252	Leader reports equipment and soldier status to higher element only when asked.			
253	Leader reports equipment and soldier status to higher when a significant change occurs and does not wait until asked or the daily report.			
254	Leader reports his unit's least exposed position based on aspects of OCOKA.			
255	Leader reports incorrect information concerning movement and/or activity accomplishment.			
256	Leader reports movement and/or activity accomplishment according to the mandated schedule.			
257	Leader reports personal/reported observations to higher without recommending a solution.			
258	Leader reports the most dangerous enemy course of action in his area to the higher element.			
259	Leader reports the most likely enemy course of action in his area to the higher element.			
260	Leader reports to the higher element, locations in his area where he is vulnerable to enemy activity.			
261	Leader reports unit movements and locations using the graphic references from the current operation.			
262	Leader requests a shift of indirect fires to facilitate friendly force action only after a request to do so from a subordinate element.			

#	Behavior	Poor	Typical	Outstanding
263	Leader requests additional assets to augment his unit to assist with mission accomplishment when his unit strength is inadequate to accomplish the mission.			
264	Leader requests additional time or assets when an unrealistic task is assigned.			
265	Leader requests an explanation or clarification from higher element concerning signals that are being used or were recently used.			
266	Leader requests an explanation or clarification from higher element concerning signals that are to be used.			
267	Leader requests artillery or close air support against enemy forces threatening his unit or mission, only after prompting from external sources.			
268	Leader requests assets to augment his unit to assist with mission accomplishment before his unit strength becomes inadequate to accomplish the mission.			
269	Leader requests change in control measures or sectors of fire to help prevent fratricide, after his unit fires on a friendly unit.			
270	Leader requests change in control measures or sectors of fire to help prevent fratricide, after receiving incoming friendly fire.			
271	Leader requests change in control measures or sectors of fire to help prevent fratricide.			
272	Leader requests engineer support to prepare/improve positions or create obstacles in support of his mission.			
273	Leader requests from higher element that his unit be allowed to rest due to impending physical exertion.			
274	Leader requests immediate artillery or close air support against enemy forces threatening his unit or mission.			
275	Leader requests medical evacuation for an injured soldier, but requires multiple transmissions to provide all necessary information.			
276	Leader requests medical evacuation for an injured soldier.			
277	Leader requests or calls for final protective fires against enemy forces in accordance with commander's guidance, orders, or the SOP.			
278	Leader requests or calls for final protective fires prematurely or too late, not in accordance with commander's guidance, orders, or the SOP.			
279	Leader requests permission to engage enemy forces outside his assigned sector.			
280	Leader requests preplanned artillery or close air support against enemy forces in accordance with commander's guidance, orders, or the SOP.			
281	Leader requests the retransmission of unit status information by subordinate units during a period when no activity of note would have exhausted supplies or degraded status.			
282	Leader requests unplanned smoke or obscurants to provide protection for his unit while in unexpected enemy contact or while in a danger area, after prompting from subordinate or higher element.			
283	Leader requests unplanned smoke or obscurants to provide protection for his unit while in unexpected enemy contact or while in a danger area.			
284	Leader retransmits to subordinates almost all of the messages he receives from above verbatim.			
285	Leader rotates tasks among subordinate units to avoid burnout.			

#	Behavior		Poor	Typical	Outstanding
286	Leader selects egress route for casualty and prisoner evacuation that avoids enemy interference.				
287	Leader sends friendly strength report to higher element at conclusion of enemy contact then corrects report due to inaccurate information.				
288	Leader shows evidence of his knowledge of the enemy's superior capabilities by not exposing his unit to enemy fires to recover wounded.				
289	Leader spot-checks subordinates to insure that his instructions are being carried out.				
290	Leader submits his periodic unit status report in accordance with the SOP.				
291	Leader submits his unit status report in accordance with the SOP after contact.				
292	Leader subordinates to follow a route that allows suspected enemy locations to have observation and fields of fire on the friendly force.				
293	Leader takes action that is beneficial to civilian population without hindering his operations.				
294	Leader takes action, but fails to report a disruptive or criminal act by a soldier.				
295	Leader takes action, then reports a disruptive or criminal act by a soldier.				
296	Leader treats sound advice/recommendation from subordinates as an interruption and takes no action.				
297	Leader uses a FRAGO to change an existing order, restating all five paragraphs of the OPOD format.				
298	Leader uses a FRAGO to change an existing order, using the OPOD format, but addresses only those elements that have changed.				
299	Leader uses an alternate frequency when the primary frequency fails to make contact with the intended station.				
300	Leader uses the same subordinate unit for all critical tasks.				
301	Leader, or his designated radio operator, answers the radio immediately during enemy contact.				
302	Leaders does not address the impact weather will have on the planned operation.				
303	The leader never provides ammo, casualty, and equipment reports unless they are requested, and even then he must ask subordinates for input before providing reports.				
304	The leader requests ammunition resupply, projecting that current supplies will be exhausted in 30 minutes given the present rate of expenditure.				
305	When asked for a SITREP while actively engaged with the enemy, the leader can immediately respond with accurate information.				
306	When asked for a SITREP while actively engaged with the enemy, the leader must first ask subordinates for information that was previously provided.				
307	When asked for a SITREP while actively engaged with the enemy, the leader must usually call subordinates to obtain some information.				
308	When providing subordinates a change of mission order, the leader fails to provide subordinates priorities of work/planning necessary to support the mission.				
309	When providing subordinates a change of mission order, the leader fails to relay mission-essential implied tasks to subordinates.				

Appendix B

Radio Communications Checklist of Leader Awareness (RCCOLA)

Radio Communications Checklist of Leader Awareness

Date _____

Time _____

Squad _____

Rater _____

PLANNING / PREPARING

OUTSTANDING

- _____ requests additional time or assets when an unrealistic task is assigned.
- _____ anticipates noncombatant actions within his area and directs elements to be prepared to respond.

TYPICAL

- _____ directs subordinates to conduct communication checks before mission begins.
- _____ conveys an accurate picture of the situation after answering some questions from subordinates.
- _____ provides warning to subordinate leaders of a change in mission upon notification from higher headquarters.
- _____ directs a "be prepared" order to subordinates, after receiving planning directions from higher.

POOR

- _____ fails to disseminate or inadequately disseminates critical change-of-mission information or factors impacting current mission to subordinates.
- _____ fails to anticipate the need for night observation devices and begins night operations without them.
- _____ does not notify appropriate personnel of the meaning of signals that are being used during an operation.
- _____ does not issue "be prepared" orders after receiving guidance from higher to do so.
- _____ does not convey an accurate picture of the situation even after answering questions.
- _____ does not convey a complete picture of the situation even after answering questions.
- _____ does not convey the commander's intent to subordinates during a change of mission order.
- _____ presents a plan that will not accomplish the task in the time required.

MOVEMENT

OUTSTANDING

- _____ anticipates activity and locates himself at the best position to control unit.
- _____ reports encountering mines or obstacles along unit route of movement and presents the operational impact or possible COAs to overcome the impediment.

TYPICAL

- _____ occasionally must ask subordinates to report their current positions.
- _____ directs a change in unit movement formation because terrain just encountered has changed.
- _____ recognizes that his unit has moved into a danger area, he reports this, and then takes action to move through or out of the danger area.
- _____ reports encountering mines or obstacles along his unit route of movement.
- _____ modifies plan or activity to accommodate a situation evolving in an adjacent friendly unit, after receiving directions to do so from a higher.

POOR

- _____ does not report that his unit is at a danger area or takes no action to avoid it.
- _____ displays little knowledge of the enemy capabilities or terrain, failing to inform subordinate of enemy activities in an area capable of observing or bringing direct fire on unit positions or activities.

ACTIONS ON ENEMY CONTACT

OUTSTANDING

- ___ when asked for a SITREP while actively engaged with the enemy, can immediately respond with accurate information.
- ___ correctly identifies weakest enemy point.
- ___ directs the relocation of a subordinate element to be prepared to assist/reinforce an expected weakness by another friendly element.
- ___ requests assets to augment unit to assist with mission accomplishment before unit strength becomes inadequate to accomplish mission.
- ___ displays evidence of fire control measures and a change in threat or danger to the unit by recommending the lifting or shifting of supporting fires in an adjacent sector.
- ___ plans personnel rotation to have best people at appropriate locations to complete critical tasks.
- ___ directs subordinates to break enemy contact because cost of fighting the enemy is higher than the benefit.
- ___ displays evidence of his knowledge of the enemy or friendly situation by relieving or replacing a unit or element before it has become ineffective.
- ___ directs subordinate to take an action that distracts the enemy from the friendly unit main effort or action.
- ___ requests ammunition resupply, projecting that current supplies will be exhausted in 30 minutes given the present rate of expenditure.
- ___ informs higher that the unit is nearing a status of non-combat effective early enough so higher can react.
- ___ presents the future likelihood of threat COAs in providing SITREPs to the higher element while actively engaged with the enemy.

TYPICAL

- ___ reports enemy activity in his area to the higher element.
- ___ moves forces to respond to an enemy attack or counterattack.
- ___ directs a soldier to take charge of an element when he is informed that the element leader is a casualty.
- ___ directs subordinates to continue actions because the mission is not yet fully accomplished or complete.
- ___ displays evidence of his knowledge about enemy capabilities and terrain by informing subordinate units of nearby enemy activities.

POOR

- ___ fails to designate a new element leader when one of them becomes a casualty.
- ___ fails to direct the replacement of a critical individual who has become a casualty.
- ___ directs that no subordinates relocate even when a subordinate element notifies him that assistance or reinforcement is needed to accomplish the mission.
- ___ directs subordinates to halt actions before the mission is accomplished/complete even though sufficient resources are available to continue the mission.
- ___ continues the operation "to the last man" and does not inform higher.

MISCELLANEOUS

OUTSTANDING

- ___ whenever asked, the leader can immediately provide a detailed and accurate platoon ACE report.
- ___ modifies his current plan/activity to accommodate a situation evolving in an adjacent friendly unit.
- ___ conveys a complete picture of the current situation to his subordinates.
- ___ takes action that is beneficial to civilian population without hindering operations.

TYPICAL

- ___ requests medical evacuation for an injured soldier.
- ___ reacts to noncombatant actions in the area.
- ___ uses an alternate frequency when primary frequency fails to make contact with intended station.
- ___ reports a change of command post location.
- ___ notifies appropriate personnel of the meaning of signals being used during an operation.
- ___ directs a change in MOPP based on commander's guidance, orders, or the SOP.

POOR

- ___ does not notify subordinates of a friendly ground unit moving through the area, which could lead to fratricide.
- ___ does not warn subordinates of civilian movement in the area.
- ___ treats a sound recommendation or advice from subordinates as an interruption and takes no action.
- ___ does not notify subordinates of a friendly aircraft moving through the area, which could lead to fratricide.
- ___ fails to direct any reallocation of critical resources

Appendix C

Future Expectations of Likely Leader Awareness (FELLA) Scale

Future Expectations of Likely Leader Awareness

Date _____
Time _____
Squad _____
Rater _____

Directions. Based on the squad and platoon radio communication you heard during the last mission, rate the Squad Leader's (SL's) likelihood of exhibiting, in most kinds of future missions, the various behaviors listed below. Use the following scale to make your ratings:

1. highly unlikely
2. unlikely
3. somewhat doubtful
4. hard to say
5. a slight chance
6. likely
7. highly likely

Select the choice which best meets with your future expectation of each behavior and enter it in the blank to the left of each item.

_____ This SL could be expected to direct squad members to conduct communication checks before future missions.

_____ When asked for a SITREP while actively engaged with the enemy, this SL could be expected to immediately respond with accurate information.

_____ This SL could be expected **not** to notify appropriate personnel of the meaning of signals that are being used during an operation.

_____ This SL could be expected to direct squad members to continue their actions if the mission is not yet fully accomplished or complete.

_____ This SL could be expected **not** to notify squad members of a friendly aircraft moving through the area, which could lead to fratricide.

_____ This SL could be expected to inadequately disseminate or fail to disseminate to squad members mission-critical change-of-mission information or factors impacting current mission.

_____ This SL could be expected to relocate a fire team or buddy team to be prepared to assist or reinforce an expected weakness by another friendly element.

_____ This SL could be expected to use an alternate frequency when the primary frequency fails to make contact with the intended station.

_____ This SL could be expected **not** to report being in a danger area or could be expected to take no action to avoid it.

_____ This SL could be expected to report a change in his location.

_____ This SL could be expected to continue an operation "to the last man" without informing the Platoon Leader.

_____ This SL could be expected to request medical evacuation for an injured soldier.

_____ This SL could be expected to display evidence of his knowledge of enemy capabilities and terrain by informing the squad of nearby enemy activities.

_____ This SL could be expected to present a plan that will **not** accomplish the task in the time required.

_____ This SL could be expected to report encountering mines or obstacles along the squad's route of movement and to present the operational impact or possible courses of action to overcome the impediment.

_____ This SL could be expected to take action that is beneficial to the civilian population without hindering his squad operations.

_____ This SL could be expected to fail to direct the replacement of a critical individual who has become a casualty.

_____ This SL could be expected **not** to issue "be prepared" orders after receiving guidance from the platoon to do so.

_____ This SL could be expected to inform the Platoon Leader that his squad is nearing a non-combat effective status early enough so the platoon can react appropriately.

_____ This SL could be expected to report enemy activity in his area to the platoon.

_____ This SL could be expected to convey an accurate picture of the situation after answering some questions from team leaders or squad members.

_____ This SL could be expected to fail to designate a new fire team leader when one has become a casualty.

_____ This SL could be expected to issue "be prepared" orders to the squad, after receiving planning directions from the Platoon Leader.

_____ After receiving directions from the Platoon Leader, this SL could be expected to modify his current plan or activity in order to accommodate an evolving situation in an adjacent friendly unit.

_____ This SL could be expected to convey a complete picture of the current situation to his squad.

_____ This SL could be expected to recognize his unit has moved into a danger area, to report this, and to take action to move through or out of the danger area.

_____ This SL could be expected to display evidence of fire control measures and to recognize a change in threat or danger to his squad by recommending the lifting or shifting of fires in an adjacent sector.

_____ This SL could be expected to report encountering mines or obstacles along the squad's route of movement.

_____ This SL could be expected to correctly identify the weakest enemy point.

_____ This SL could be expected **not** to convey an accurate picture of the situation, even after answering questions.

_____ This SL could be expected **not** to convey the commander's intent to squad members during a change-of-mission order.

_____ This SL could be expected to direct his squad to take an action that distracts the enemy from the friendly unit main effort or action.

_____ This SL could be expected to request ammunition resupply, projecting that squad supplies will be exhausted in 30 minutes given the present rate of expenditure.

_____ This SL could be expected to direct a change in MOPP based on commander's guidance, orders, or the SOP.

_____ This SL could be expected to anticipate noncombatant actions in his area and to direct his squad to be prepared to respond.

_____ This SL could be expected **not** to warn his squad of civilian movement in the area.

_____ This SL could be expected to anticipate activity and to locate himself at the best position to control his squad.

_____ This SL could be expected **not** to notify squad members of a friendly ground unit moving through the area, which could lead to fratricide.

_____ This SL could be expected to display evidence of his knowledge of the enemy or friendly situation by relieving or replacing squad members before they become ineffective.

_____ This SL could be expected to react to noncombatant actions in his area.

_____ This SL could be expected to direct a change in the squad's movement formation because the terrain they just encountered has changed.

_____ This SL could be expected **not** to relocate personnel when one team notifies him that assistance or reinforcement is needed to accomplish the mission.

_____ Whenever asked, this SL could be expected to immediately provide a detailed and accurate ACE report.

_____ In providing SITREPs to the Platoon Leader while actively engaged with the enemy, this SL could be expected to present the future likelihood of threat COAs.

_____ This SL could be expected to halt squad actions before the mission is accomplished or complete, even though sufficient resources are available to continue the mission.

_____ This SL could be expected to move personnel to respond to an enemy attack or counterattack.

_____ This SL could be expected to fail to anticipate the need for night observation devices and to begin night operations without them.

_____ This SL could be expected to notify appropriate personnel of the meaning of signals currently being used during an operation.

_____ This SL could be expected to direct a soldier to take charge of a fire team when informed its leader is a casualty.

_____ This SL could be expected to request additional time or assets when an unrealistic task is assigned.

_____ This SL could be expected to display little knowledge of enemy capabilities or terrain, by failing to inform his squad of enemy activities in an area where they are capable of observing or bringing direct fire upon squad positions or activities.

_____ This SL could be expected to modify his current plan or activity in order to accommodate an evolving situation in an adjacent friendly unit.

_____ This SL could be expected to provide a change-of-mission warning to his fire team leaders upon notification from the platoon.

_____ This SL could be expected to occasionally ask squad members to report their current positions.

_____ This SL could be expected to plan personnel rotations to have the best soldiers at the right locations to complete critical tasks.

_____ This SL could be expected to treat sound advice from his team leaders as an interruption and to take no action on their recommendations.

_____ This SL could be expected to direct subordinates to break enemy contact because the cost of fighting the enemy is higher than the benefit.

_____ This SL could be expected to request platoon assets to augment his squad before its strength becomes inadequate to accomplish the mission.

_____ This SL could be expected to fail to direct any reallocation of critical resources.

_____ This SL could be expected **not** to convey a complete picture of the situation, even after answering questions.

Overall, how would you expect this SL's level of situational awareness to be in future missions, relative to other SLs?

- _____ Outstanding
- _____ Well above peers
- _____ Slightly above the norm
- _____ Center of mass
- _____ Slightly below the norm
- _____ Well below peers
- _____ Poor

Appendix D

Observation Frequency of RCCOLA Items by Two Raters Over 42 Experimental Trials

Radio Communications Checklist of Leader Awareness

Date _____

Time _____

Squad _____

Rater _____

PLANNING / PREPARING

OUTSTANDING

- 0 requests additional time or assets when an unrealistic task is assigned.
- 4 anticipates noncombatant actions within his area and directs elements to be prepared to respond.

TYPICAL

- 56 directs subordinates to conduct communication checks before mission begins.
- 29 conveys an accurate picture of the situation after answering some questions from subordinates.
- 64 provides warning to subordinate leaders of a change in mission upon notification from higher headquarters.
- 12 directs a "be prepared" order to subordinates, after receiving planning directions from higher.

POOR

- 45 fails to disseminate or inadequately disseminates critical change-of-mission information or factors impacting current mission to subordinates.
- 3 fails to anticipate the need for night observation devices and begins night operations without them.
- 0 does not notify appropriate personnel of the meaning of signals that are being used during an operation.
- 5 does not issue "be prepared" orders after receiving guidance from higher to do so.
- 35 does not convey an accurate picture of the situation even after answering questions.
- 52 does not convey a complete picture of the situation even after answering questions.
- 14 does not convey the commander's intent to subordinates during a change of mission order.
- 0 presents a plan that will not accomplish the task in the time required.

MOVEMENT

OUTSTANDING

- 3 anticipates activity and locates himself at the best position to control unit.
- 0 reports encountering mines or obstacles along unit route of movement and presents the operational impact or possible COAs to overcome the impediment.

TYPICAL

- 20 occasionally must ask subordinates to report their current positions.
- 28 directs a change in unit movement formation because terrain just encountered has changed.
- 37 recognizes that his unit has moved into a danger area, he reports this, and then takes action to move through or out of the danger area.
- 3 reports encountering mines or obstacles along his unit route of movement.
- 9 modifies plan or activity to accommodate a situation evolving in an adjacent friendly unit, after receiving directions to do so from a higher.

POOR

- 62 does not report that his unit is at a danger area or takes no action to avoid it.
- 17 displays little knowledge of the enemy capabilities or terrain, failing to inform subordinate of enemy activities in an area capable of observing or bringing direct fire on unit positions or activities.

ACTIONS ON ENEMY CONTACT

OUTSTANDING

- 41 when asked for a SITREP while actively engaged with the enemy, can immediately respond with accurate information.
- 1 correctly identifies weakest enemy point.
- 3 directs the relocation of a subordinate element to be prepared to assist/reinforce an expected weakness by another friendly element.
- 0 requests assets to augment unit to assist with mission accomplishment before unit strength becomes inadequate to accomplish mission.
- 0 displays evidence of fire control measures and a change in threat or danger to the unit by recommending the lifting or shifting of supporting fires in an adjacent sector.
- 0 plans personnel rotation to have best people at appropriate locations to complete critical tasks.
- 5 directs subordinates to break enemy contact because cost of fighting the enemy is higher than the benefit.
- 0 displays evidence of his knowledge of the enemy or friendly situation by relieving or replacing a unit or element before it has become ineffective.
- 0 directs subordinate to take an action that distracts the enemy from the friendly unit main effort or action.
- 0 requests ammunition resupply, projecting that current supplies will be exhausted in 30 minutes given the present rate of expenditure.
- 0 informs higher that the unit is nearing a status of non-combat effective early enough so higher can react.
- 0 presents the future likelihood of threat COAs in providing SITREPs to the higher element while actively engaged with the enemy.

TYPICAL

- 155 reports enemy activity in his area to the higher element.
- 19 moves forces to respond to an enemy attack or counterattack.
- 0 directs a soldier to take charge of an element when he is informed that the element leader is a casualty.
- 13 directs subordinates to continue actions because the mission is not yet fully accomplished or complete.
- 215 displays evidence of his knowledge about enemy capabilities and terrain by informing subordinate units of nearby enemy activities.

POOR

- 0 fails to designate a new element leader when one of them becomes a casualty.
- 0 fails to direct the replacement of a critical individual who has become a casualty.
- 0 directs that no subordinates relocate even when a subordinate element notifies him that assistance or reinforcement is needed to accomplish the mission.
- 1 directs subordinates to halt actions before the mission is accomplished/complete even though sufficient resources are available to continue the mission.
- 0 continues the operation "to the last man" and does not inform higher.

MISCELLANEOUS

OUTSTANDING

- 2 whenever asked, the leader can immediately provide a detailed and accurate platoon ACE report.
- 0 modifies his current plan/activity to accommodate a situation evolving in an adjacent friendly unit.
- 15 conveys a complete picture of the current situation to his subordinates.
- 0 takes action that is beneficial to civilian population without hindering operations.

TYPICAL

- 0 requests medical evacuation for an injured soldier.
- 8 reacts to noncombatant actions in the area.
- 2 uses an alternate frequency when primary frequency fails to make contact with intended station.
- 111 reports a change of command post location.
- 50 notifies appropriate personnel of the meaning of signals being used during an operation.
- 2 directs a change in MOPP based on commander's guidance, orders, or the SOP.

POOR

- 1 does not notify subordinates of a friendly ground unit moving through the area, which could lead to fratricide.
- 1 does not warn subordinates of civilian movement in the area.
- 0 treats a sound recommendation or advice from subordinates as an interruption and takes no action.
- 0 does not notify subordinates of a friendly aircraft moving through the area, which could lead to fratricide.
- 0 fails to direct any reallocation of critical resources